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T R A I L & L A N D S C A P E

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THE OTTAWA FIELD-NATURALISTS' CLUB
- Founded 1879 -

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(Editorial Address: see opposite)

PINE LAKE, in CIP Nature Centre near Harrington, Quebec
Photograph by Marguerite Sweers

F O N NEWSPAGE

The Federation's fortieth Annual Meeting was held in Sarnia in April. Ten resolutions were passed by the 600 members present. These resolutions have been forwarded to the governments concerned. Five of the resolutions dealt with the export, import or transit of endangered species, Suffield Military Reserve for a National Park, a ban on air cushion vehicles, the preservation of the Niagara Escarpment, and discouraging a second major airport near Toronto. The other five resolutions are as follows:

To the Government of Ontario: 1. that the use of defoliants, weed killers and allied chemicals and preparations along all rights-of-way, including those of Ontario Hydro, be examined with a view of seeking other methods of control.
2. that it initiate specific policies that will ensure that full environmental and aesthetic considerations be given to all road projects and government construction projects.
3. that policies be initiated to encourage the owners of agricultural land to maintain and/or to provide wildlife habitats such as shrub fencing, woodlots, marshes, ponds, streams and native tree plantings.
4. commends the Government of Ontario on the decision to remove the wolf bounty.

To the Government of Canada: recognizing that the exponential growth of human populations is fundamental to increasing environmental degradation, pollution, resource depletion, extinction of species, and general deterioration of the human condition in almost all parts of the world and recognizing also that Canada is in a unique position to set a world example in this regard, be it resolved that the F.O.N. urges the Government of Canada to set as an immediate priority the development of a population policy which would involve the earliest possible stabilization of human numbers in Canada.

Allan H. Reddoch

Among the more spectacular sights of the heavens are the ghostly northern lights or aurora borealis. These are so impressive that they are often used to symbolize the Arctic, the winter, and sometimes Canada generally. Besides being on Christmas cards and in magazine illustrations, they are represented on the present one cent stamp and the regular one dollar coin. We in Ottawa are fortunate to be able to see auroral displays fairly often.

The aurora can take a myriad of forms, and it is probably true to say that neither words nor pictures can give an adequate description to someone who has not seen it for himself. For scientific purposes these forms have been classified into about a dozen types including arcs, draperies, rays, coronae and flaming aurorae. An arc may be a uniform arch of light stretching from horizon to horizon with a fairly sharp lower edge. Sometimes there is more than one arc, and a related form can have some bends in it. Draperies are rather like the view which an ant might get looking up at a curtain or drape. Here there may be a sharp, somewhat serpentine lower edge with vertical lines suggesting the folds of a curtain which is moving in a light breeze. Rays are simply groups of vertical lines of light. Of course, the northern lights do not fit into these distinct classes as neatly as mammals may be

classified into species. Rather, there is a continuous range of forms, and often a display may start as an arc and change gradually into a rayed structure and then to a drapery. Sometimes a strong display may end as a corona in which rays seem to radiate in all directions from a single point high in the sky. This form seems to be more common further north than at Ottawa. Another form which may occur near the end of a display, and is seen occasionally here, is the flaming aurora. Here one sees light shooting upwards to the zenith very much the way a flame would flicker.

The brightness of the aurora can vary greatly. Reports from seven centuries ago in Greenland speak of being able to go hunting by the light, while from this century in Canada the description is of reading a newspaper. Most displays here are nowhere near that bright, and they can be as faint as the eye can detect. Almost every colour seems possible, but green is probably the most common, followed by red. Often a green drapery with a red lower border is seen. Other colours reported include yellow, orange, blue-gray and purple. If the light is very faint, the colour receptors of the eye do not respond, and only a dim white light is seen. However, in these cases, a long exposure on colour film may show green or purple in the photograph, but such photos may not be too accurate in colour because of the reciprocity failure of the film during long exposures.

Where and When

The association of the aurora with the Arctic and with Canada is to some extent justified. But it is not ours exclusively. Studies over many years have shown that displays are seen most frequently (almost every clear night) from a roughly circular band which passes over the Soviet Arctic Ocean, northern Norway, Iceland, southern Greenland, Ungava, the center of Hudson Bay, Great Slave Lake, Great Bear Lake, and the northern coast of Alaska. Inside this band the frequency decreases to perhaps once a week near the center at N.W. Greenland and Ellesmere Island. Outside the band it decreases to about 20 per year at Ottawa and one in ten years in the Caribbean and southern Europe. Probably every place on earth has had an aurora at some time or other. Thus over the last century displays have been reported from Greece, Bombay and Singapore. Two cen-

turies ago it was realized that the aurora borealis is associated with the earth's magnetic poles and that there should be a corresponding phenomenon in the south. It was Capt. Cook who in 1773 first reported and named the aurora australis. This seems to be quite equivalent to its northern counterpart. Indeed Cook's records showed that on the nights when he saw a good display, one was also seen in northern Europe. Modern observations confirm that frequently a northern aurora is accompanied at the same time by a southern one. However most southern displays occur over Antarctica or the southern Indian Ocean where few people travel and fewer live. Aside from Antarctic research stations, only southern Australia and New Zealand see enough of the aurora australis to permit study.

It has been shown by triangulation that the lowest part of the lights is usually at least 60 miles above the earth's surface. From this it can easily be calculated that if we see a display just above the northern horizon at Ottawa, it may be 700 miles or more north of us. This means it would be above Hudson Bay.

MULTIPLE ARCS above hills north of the Ottawa River.

The northern lights are often regarded as mainly a winter phenomenon. While it may be that people are more likely to see them in winter because the nights are longer than in the summer, records show that displays are more frequent in the spring and fall months. It has also been found that certain times of the night are more favourable than others. At Ottawa the best time should be around 11 PM; however, any time from 9 PM to 1 AM is fairly good. Moreover, a display can easily continue to 3 AM, and there seems to be another favourable time around 6 AM.

Another, more famous, time dependence is the 11 year period, sometimes called the sunspot cycle. It has been known for a long time that sunspots build up to a maximum frequency every 11 years, and so do the northern lights. Actually their peak seems to occur about a year after the sunspot peak. The most recent peak was around 1969-1970, so we now are headed for a quieter period. Unfortunately this last maximum was not very impressive. Certainly most of the displays which I have seen in Ottawa the last two or three years were rather tame compared to those I saw here during a previous maximum about 1948.

The aurorae are known to be connected with sunspots and this has been demonstrated by the less well-known 27-day cycle. This is the period of rotation of the sun, and a large sunspot may last long enough to reappear at the same part of the sun after this time. There are a number of examples where, after a particularly big auroral display, another has been seen 27 days later.

It must be realized that the generalizations about favourable times mentioned above are only guidelines. This was demonstrated on June 17-18 of this year. A most impressive display occurred that night even though we are past the peak of the most recent 11-year cycle, and that peak was not a very active one. The aurora of June 17 continued all night. One amateur astronomer told me he could see it in the twilight. We saw mainly greenish rays which moved over every part of the sky and sometimes reached from the zenith to the horizon. At the zenith a corona was distinctly visible. At several times after midnight we saw the flaming aurora shooting toward the zenith.

The Myths and the Theories

Men have undoubtedly been intrigued by the aurora for a long time. One might imagine that northern people would take them somewhat for granted, and this seems to be borne out by their legends regarding them. Some Eskimo regard the lights as guides to a better land for the departed. A tale attributed to Canadian Indians tells of a very strong hunter who, after a series of trials and adventures, won as his wife a beautiful fairy.

AURORAL RAYS above the smoke and lights of the mills at Gatineau, P.Q.

Kodachrome II transparencies by Allan Reddoch, converted to black and white prints by John Kempt.

But later, on a visit back to his own people, he forgot about her because of bad magic. She managed to find him, however, and when reunited, they shuddered as they thought of their separation. Through her powers they then went on the back of a great bird to the Land of Eternal Memory, having resolved to forsake this Land of Forgetfulness. There they became the Northern Lights, and can still be seen with their children around them, in the northern sky, still trembling when they remember their troubles here below. This remarkable example of aesthetic appreciation is in marked contrast to the response of continental Europeans in earlier centuries. An aurora is a rare event in southern Europe, and when a great one occurs, it is likely to be red. Such a display was likely to inspire superstitious awe, if not terror, in its viewers. They usually spoke of fire and blood and of swords and battles. These events were frequently regarded as omens, although on occasion the fire was imagined to be real. The Roman writer Seneca tells us that in 37 AD a red aurora was seen to the west of Rome, and units of the army were dispatched to the aid of the port city of Ostia which was thought to be ablaze. Something similar happened in England in 1938 when Windsor Castle was reported to be on fire.

There were also attempts at rational explanations, but until about 200 years ago these foundered for lack of scientific knowledge. Aristotle, in about 350 BC, had the Greek word "chasmata" for the aurora, suggesting that it was caused by cracks in the sky through which the eternal fires beyond could be seen. About 1250 AD, the Norse and Greenlanders had a similar theory that Greenland, being near the edge of the earth, could see the fires that encircle the oceans. However, some of them were more inclined to the theory that the "glaciers had become so powerful that they radiated" these lights. Some readers who were children at the turn of this century may recall hearing a related idea that the aurora was caused by sunlight reflected on tumbling icebergs in the Arctic. However it was over 200 years ago that scientists rejected this idea.

Scientific study of the aurora began about 200 years ago and intensified greatly early in this century. The coming of the space age with its sounding rockets and satellites has provided great amounts of new data

and several valuable insights. Nevertheless there are still some aspects of the phenomenon which are not yet understood. The following outline is necessarily very sketchy. It had long been realized that the aurora is closely connected with the earth's magnetic field and with the solar storms known as sunspots and solar flares. These are also related to the magnetic storms during which the compass needle shows small instabilities, and to communications problems when long distance radio reception can be blacked out and telegraph signals can be lost because of large currents on the lines. These connections became clearer with the discovery of the Van Allen belts and the solar winds.

The Van Allen belts are regions thousands of miles above the earth's atmosphere where moderately energetic, electrically charged particles, electrons and protons, are trapped by the earth's magnetic field. These particles oscillate back and forth between north and south every few minutes. The solar wind is a continuous stream of charged particles radiating from the sun, which keeps the tails of comets pointed away from the sun. It also affects the outer parts of the earth's magnetic field. When there are sun spots or solar flares, the solar wind may have strong gusts of particles which cause both erratic disturbances of the earth's magnetic field which are recognized as magnetic storms, and changes in the upper atmosphere which affect radio communication. At the same time, in some way which is not yet understood, groups of energetic particles may appear in the Van Allen belts. These also travel to the north and south, but are not trapped and plunge into the atmosphere in both polar regions at about the same time. Here they collide with atoms and molecules of oxygen and nitrogen, and transfer energy to these until by about 60 miles above the earth the atmosphere has become dense enough that they have lost all their available energy. The result is quite analogous to a neon sign or a mercury or sodium vapour lamp. The atoms and molecules get rid of the extra energy they received by emitting light of various colours. Spectroscopy, the study of such colours, shows that the common green colour arises from oxygen atoms, while the lower red border is caused by nitrogen molecules. In earlier years various misidentifications were reported, but it now appears that almost all visible colours come from the two commonest

elements of the atmosphere - oxygen and nitrogen.

Many scientists continue to study the aurora, especially in Scandinavia, the U.S. and Canada. In this country, work is done at the Universities of Calgary and Saskatchewan, the Defence Research Board, and the National Research Council, and other places. The rocket range at Churchill and the Canadian Allouette and Isis satellites provide data. Such studies help us to understand not only the aurora, but also the upper atmosphere and radio communication. Some aspects of the problem are also related to the studies of plasma physics and magnetohydrodynamics which are presently very active. The reader who is interested in more detail about the aurora might enjoy the book by W. Petrie entitled KEOEEIT, The Story of the Aurora Borealis, available at the public library. Written in 1963, it is still a good summary, and can easily be read by the scientifically inclined layman.

Suggestions for Observation and Photography

Anyone who wants to see the northern lights is best to be well away from the city limits with a good view of the northern horizon, and to check periodically from 9 PM onwards, especially in the spring and fall. The light and smog of the city will reduce the visibility particularly in the south of Ottawa. However, as long as the northern stars can be seen, there is a good chance of seeing an aurora if it is present. It can also be seen from indoors if the lights have been out for a few minutes to allow the eyes to adapt to the dark.

Interesting and impressive photographs can be taken using a fast film or lens. Even a slow colour film will give good results with an exposure of several minutes. The resulting picture may appear brighter than what the eye saw, and the colour may not be exactly right because of the reciprocity failure of the film during long exposures. The major difficulty, though, is that in several minutes the structure of the rays may be blurred because of their motion. This would be less serious with a really fast film such as some black and white types together with a fast lens.

Know Your Committees ... ... # 3

THE EDUCATION COMMITTEE

When the formation of an "Education Committee" was first proposed, the obvious question was, "Who is to be educated?". Since the Excursions and Lectures Committee has the job of "educating" our own club members (in an entertaining way, of course), it seemed what was needed was a group to reach out to the general public, both young and old, to bring the lessons of natural history within easy reach.

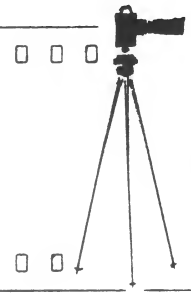
These aims were focussed into several projects. The most successful has been the job of supplying field trip leaders and teachers of natural history to schools and groups such as the Boy Scouts and Girl Guides. Trips have been led by some of our own committee members as well as others in the club, and even by the more experienced members of the Macoun Field Club's Senior Group.

The only limit to the committee's efforts to supply leaders and instructors is its list of volunteers. If any readers feel they are willing and able to lead children (or adults) on field trips, or to give classroom lessons in some field of natural history, no matter how infrequently they are available, we would greatly appreciate hearing from them.

Irwin M. Brodo, Chairman
phone 224-7077

USEFUL PUBLICATIONS TO SEND FOR....

Guide to Conservation Areas (of Ontario), The Moose in Ontario, The Beaver in Ontario, and The Ruffed Grouse in Ontario are four new publications which are available on request from Information Services Branch, Ministry of Natural Resources, Parliament Buildings, Toronto, Ontario.



NATURE PHOTOGRAPHY WORKSHOP

MUSHROOMS AND TOADSTOOLS

After the heat of the summer, the rains of late August bring forth such delightful shapes and colours. Yes, oranges, reds, yellows and even purple fungi can be found around rotting logs and bark at the edge of the forest. These present a real challenge to the photographer bent on discovery. These fungi in many cases break down the forest roots and branches to return humus to the soil, thereby fulfilling nature's cycle of growth, death and regrowth.

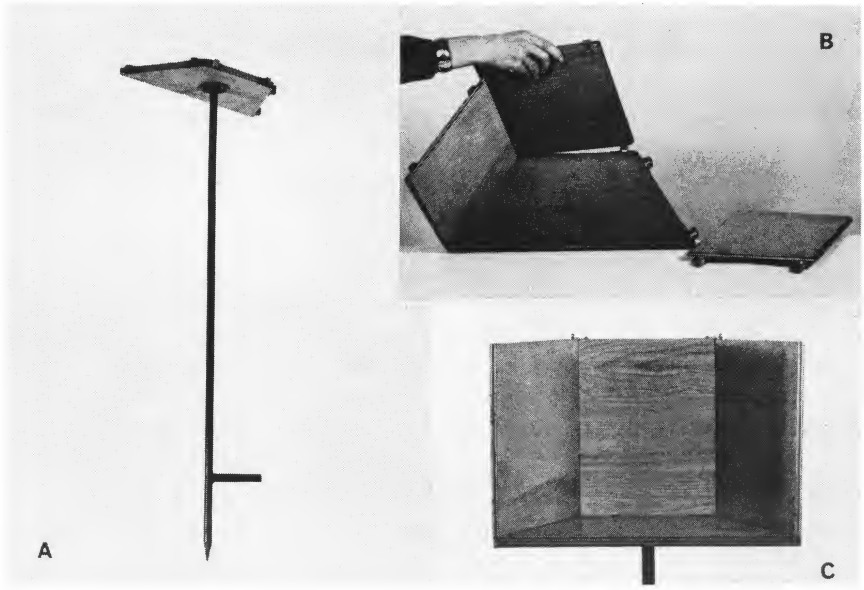
In many cases these little beauties are hiding in the shady woods - where the light is very weak. You can get a flash! or you can wait until some light flows through the branches or you can remove the subject and set it up where light conditions are favourable.

If you are a "dyed-in-the-wool" naturalist, you must take it where it is growing, hence flash. If you are collecting slides for shows, you will set it up where light conditions are favourable!

I carry a stainless steel trowel in the trunk of my car, hang it on my belt for such occasions.

Nature slides must have definition, must be really sharp and the correct colour. To get structures such as the gills sharp, and with modelling, you need side lighting which casts tiny shadows from the gills. This improves the appearance of the structure and makes a pattern. You can often make a setup with surrounding moss and bark from a dead tree for a background. Now, you have to stoop down or lie prostrate and focus in on the toadstool.

There is another way. To make these portraits easier to capture, a platform can be built so that a better camera angle and more effective lighting conditions may be achieved. The stand can easily be dismantled and carried in the car trunk or on field trips, and set up in a few minutes.



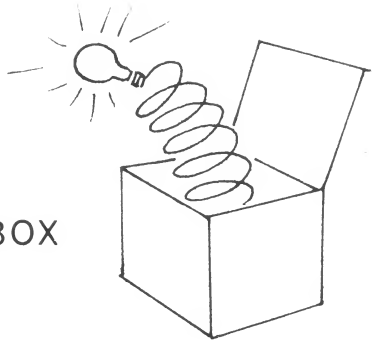
The stand shown here can be made by a local carpenter. A stage of $\frac{3}{4}$ inch plywood, $9\frac{1}{2}$ x $9\frac{1}{2}$ x $9\frac{1}{2}$ x $19\frac{1}{2}$ inches, was used (fig. 1A). Six clamps were attached to the outside edge so that wooden inserts could be pushed in to hold up the sides of the platform. A metal pipe ($\frac{3}{4}$ inch) was screw-threaded at one end in order to attach it to the platform, and sharpened at the other end to make it easier to push into the earth. A foot "step" 8 inches from the point was welded to the pipe (fig. 1A) for ease of pushing into the earth.

Three removable sides 12 inches in height of 3/8 in. plywood can be placed in position or removed, depending on wind conditions and background selected (fig. 1B). If a bright subject is selected you can set up the stand with a shadowed area as the background. Also, silver paper can be used to reflect light upwards into the pattern of gills (fig. 1C) when the sides are in position. The stand is 40 inches high when set up for work. This allows for a low angle shot within the range of the average tripod.

What is a picture? Try to get groups in different degrees of size, shape and maturity. This depicts development and is more pleasing. If the mushrooms grow solitary, perhaps you can settle for one. Many grow in clusters on bark or logs - then it requires real study to pick out or limit yourself to a specific group which has nice composition. To make these sculptured beauties come alive on the screen, you must fill the frame. Closeup photography means closeup lenses or rings to get closer to the subject. If you really are keen to collect nature's charmers, see about more equipment and join a photographic club where you can learn how to go closeup hunting in the autumn. Such closeup photography also requires patience and skill to clean up the subject - a little yellow straw may ruin an otherwise beautiful slide. A thru-the-lens focussing camera is almost a must. A group of photographers can spend an interesting afternoon discovering fungi and taking closeups to add to their collections. If you are interested, phone the author of these notes some day in September! ... W.R. Childers

Pholiota: a group growing on cut birch log
(print by E. Amey from colour slide of W.R. Childers)

T&L SUGGESTION BOX



An interested reader of Trail & Landscape since its first appearance, Howard J. Darling of Ottawa has written us a letter which includes the following stimulating thought to share with other readers:

"...during frequent trips to Toronto via Highway 7 I have noticed that the C.P.R. alternate Montreal-Toronto line via Peterboro has been almost entirely unused for the past couple of years between Glen Tay Junction, west of Perth, at least to Tweed and perhaps as far as Havelock, a distance of some 70 miles. It is unploughed in winter, the rails are well rusted and have become buried at dirt crossings, so that it would seem that the railway is managing to get along without it, although I don't believe any formal application for abandonment has been made.

"This prompts me to ask whether anyone has thought of converting this right of way, most of it through very scenic country, into a hiking or a bicycling trail. It would offer a strategic link between the Rideau Trail and the Trent Valley and could serve as a main link in a future trans-provincial trail. At Sharbot Lake it intersects another abandoned branch extending as far north as Renfrew. Perhaps if sufficient public interest were arounsed the C.P.R. might welcome the opportunity to donate it for that purpose, as it has not always been easy to obtain authorization to abandon lines."

Lampreys of the Ottawa Area

by Vadim D. Vladykov

The destruction of commercial fishes of the Upper Great Lakes by the "deadly kiss" of the sea lamprey is well publicized (Lawrie, 1970). However, very few naturalists of the Ottawa area have an opportunity to observe lampreys at close hand. The purpose of the present article is to popularize the knowledge of the life history of lampreys, some of which play a very important role in Eastern Canadian waters.

Lampreys belong to the Class Cyclostomata which has many affinities with the Devonian vertebrates known as Ostracodermi. The lampreys differ from other aquatic vertebrates, for instance, bony fishes, by a lack of several important features: jaws, gill covers, bones in skeleton, paired fins, air bladder and scales, to mention a few. The shape of a lamprey is eel-like and the skin is rich in mucus glands. The head is provided on each side with 7 oval gill openings. Although lampreys no doubt are a very ancient group of vertebrates, at present some species, particularly their larvae, are very abundant (Vladykov, 1952; Manion & Purvis, 1970).

The life history of lampreys is as follows. During May or June, they spawn in rather swift running brooks or rivers. They nest on gravel riffles where both sexes take part in removing stones with their sucking mouths and digging shallow depressions within which they subsequently spawn. After reproduction, all spent lampreys die. The eggs remain for some time in the nests. They are rather small, about 1 mm in diameter. In small species, such as the American brook lamprey (Lethenteron lamottei), the average number of eggs per female is less than 4,000 while in somewhat larger parasitic species as the silver lamprey (Ichthyomyzon unicuspis), this number is about 19,000. In the much larger sea lamprey (Petromyzon marinus), the average number of eggs is about 60,000 in landlocked specimens, and in the anadromous specimens, may be as high as 172,000 (Vladykov, 1951).

Depending on the water temperature, the lamprey larvae known as ammocoetes hatch in 7-10 days. These larvae drift downstream, until they become lodged in the mud banks of the spawning streams or rivers in rather shallow and quiet water. Here they burrow into the soft bottom and spend several years (probably from 4 to 7) as larvae, feeding on phytoplankton which they strain from the water and the oozy layer on the bottom.

The ammocoetes are of the same body shape as transformed specimens, but they differ from the adult lampreys by a toothless, horseshoe-shaped mouth with a fleshy overhanging hood and by eyes buried under the skin (fig. 1). In ammocoetes, during feeding and respiration, the water stream enters the mouth and leaves through gill openings. In the transformed lamprey, the water for respiration enters and leaves through the gill openings.

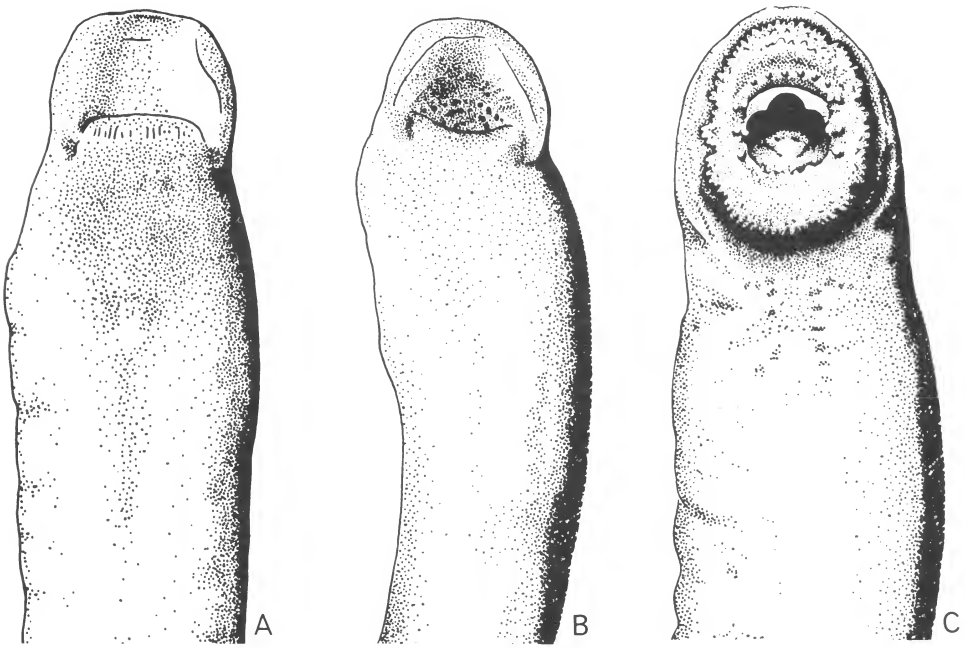


FIG. 1 Ventral views of heads of larvae (ammocoetes) and an adult of the American brook lamprey, Lethenteron lamottei (from Vladykov, 1949). A - an ammocoete (150 mm) B - an ammocoete during metamorphosis (about 150 mm); C - an adult female (152 mm).

Through several changes in their interior anatomy and particularly in the shape of the mouth, ammocoetes eventually metamorphose into adult lampreys. The mouth of transformed lampreys is circular in shape and provided with horny teeth. In parasitic species, old worn-out teeth are replaced by new ones (Vladykov and Mukerji, 1961). In nonparasitic species, there is either no teeth replacement at all, or a single replacement. Moreover, the eyes in transformed lampreys are well developed.

In all transformed lampreys, irrespective of their feeding habits, there is a pair of buccal glands with ducts opening ventrally at the base of the tongue. These glands in parasitic species secrete an anticoagulant (Baxter, 1956).

After metamorphosis, the life of the lampreys follows one of two courses. In one type of life-cycle, as is the case of the silver (I. unicuspis)and sea (P. marinus) lampreys, the transformed individuals retain a functional digestive tract and develop strong sharp teeth. They feed by attaching themselves to fishes and, with the sucking disc, after rasping a hole through the body covering, suck the blood and fragments of muscle from the host. They continue to live and grow for one (silver lamprey) or two years (sea lamprey) (Vladykov, 1949). Upon reaching sexual maturity, they reascend the streams or rivers, spawn, die, and thus complete their life cycle.

The American brook lamprey (L. lamottei) belongs to the contrasting life history type. They cease entirely to feed and grow in length after metamorphosis, which begins in late summer or early fall. Without taking any food, they continue to live for a few months more, usually about half a year. During the maturation period, the body shrinks in length, and thus the gap between two dorsal fins, so characteristic of immature transformed lampreys of all species except those of the genus Ichthyomyzon, disappears and the two fins become almost continuous in mature lampreys[1].

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1) It was observed (Vladykov & Roy, 1948) that a spawning individual of I. unicuspis during maturation period, may lose from 4% to 22% in the total length.

In these nonparasitic adults, the digestive tract remains in a non-functional condition, or even degenerates (Battle & Hayashida, 1965). Having passed through the winter,they spawn the following spring, then die as do the parasitic species.

There is no pronounced difference in length between male and female lampreys of any species.

Around the national capital, in the Ottawa River, only silver lamprey (I. unicuspis) has been reported (McAllister, 1968). Collected specimens were clinging either to scaleless fishes such as the brown bullhead (Ictalurus nebulosus) and the sturgeon (Acipenser fulvescens), or to species with small scales such as the eel (Anguilla rostrata) and the white sucker (Catostomus commersoni).

However, in the Ottawa area is present another species, L. lamottei (fig. 2), which is not a parasitic lamprey. It appears that it is very abundant in spring, previous to spawning, in the Gatineau River, below the Petites Chutes, at Limbour, P.Q. There, on May 17, 1959, several transformed specimens were collected by R.P. Maurice Gobeil and Alfons Lutz.

P. marinus (fig. 4B) has not yet been reported from the Ottawa area. However, because of general interest in this destructive parasite and the possibility that it could one day get through the Point Fortune Falls or be brought in by bird or man, it is included in the present article.

The adult lampreys of the three species can be easily told apart. The silver lamprey has united dorsal fins. In younger transformed individuals of I. unicuspis (fig. 3), the lateral line organs are not pigmented, but in older individuals of 170 mm and over, these organs become almost black. In the two other species, the lateral line organs are unpigmented. Moreover, the number of muscular trunk segments or myomeres (between the last gill opening and the anus) in I. unicuspis varies from 47 to 55, with an average of 51. The total length of transformed individuals is 89-312 mm. The remaining species have two separate dorsal fins and the number of myomeres is much higher, 64-74, with an

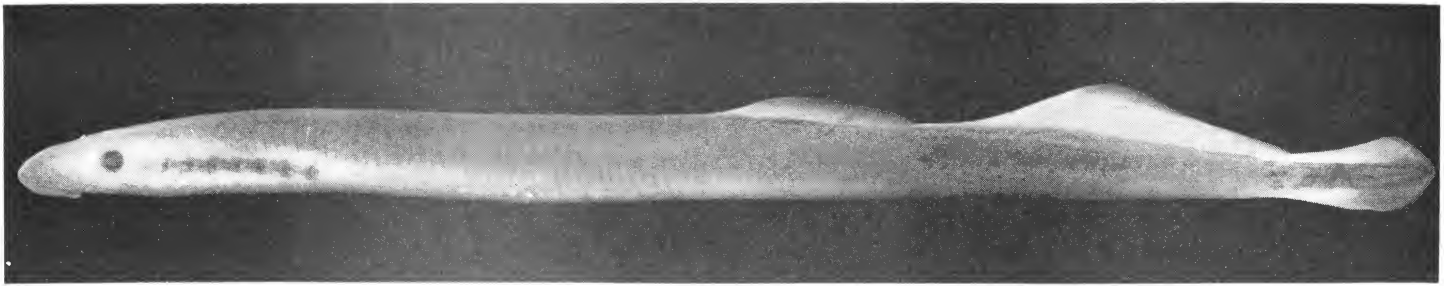

FIG 2 American brook lamprey, Lethenteron lamottei, from the Gatineau River. Photograph by George Ben, University of Ottawa. A prespawning female, 161 mm. Note: the two dorsal fins are well separated by a wide space.

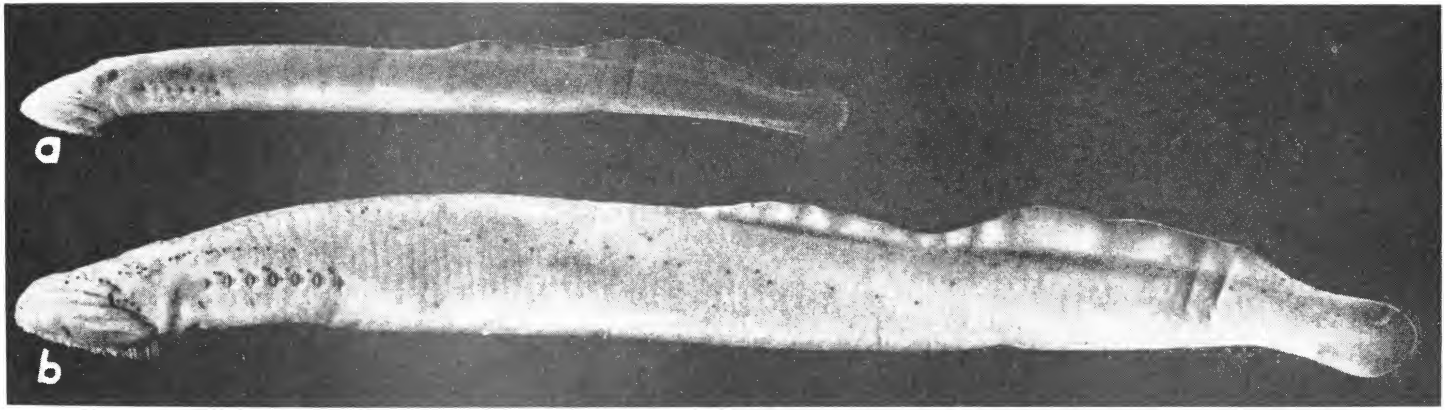

FIG 3 Silver lamprey, Ichthyomyzon unicuspis: a) young female, 106 mm; b) nearly mature famale, 240 mm (from Vladykov, 1949). Note: in this species there is only one dorsal fin. The black pigmentation of lateral line organs is clearly visible in the larger specimen.

average of 68 for L. lamottei, and 70 for P. marinus. The size of transformed sea lampreys varies from 135 to 941 mm; and that of L. lamottei is 112-187 mm.

The three species of lampreys[2] under discussion can be easily separated also by differences in the number, size, and disposition of the teeth on their sucking disc (fig 4). For a description of ammocoetes readers are referred to earlier publications (Vladykov, 1949, 1950, 1960).

Ammocoetes of all species and transformed nonparasitic lampreys can be considered useful, as they serve as food for a number of sport and commercial fishes and other animals. The transformed parasitic lampreys such as I. unicuspis and particularly P. marinus are predacious and very destructive. To reduce the stock of P. marinus in the Upper Great Lakes several methods have been tried. The most promising is the use of the larvicide "3-trifluormethyl-4-nitrophenol" (Smith, 1967). Unfortunately this and other chemical products affect adversely the other fishes also. In my opinion, the most logical and effective method would be "biological control". It would consist in furthering a natural competition for food among ammocoetes of parasitic and nonparasitic species living in the same brook.

According to my observations (Vladykov, 1949, 1952) among eastern North American lampreys the ammocoetes of L. lamottei are the largest, up to 204 mm in length, while those of P. marinus do not grow beyond 188 mm. Ammocoetes of some nonparastiic European lampreys are even larger than those of L. lamottei.

Recently, Manion and Purvis (1970) described the capture of six females of the giant American brook lamprey (L. lamottei) in the Upper Great Lakes. The length of these specimens was 260-299 mm, that is, about twice the common size of this species from Quebec or Ontario. To explain this unusual size, Manion and Purvis suggest that these "giant lampreys may have fed parasitically after metamorphosis". Five of these

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2) A key for the identification of the genera of Holarctic lampreys by their teeth arrangements is given by Vladykov & Follett (1966).

specimens were immature famales (the dorsal fins far apart and eggs of small diameter, (0.18-0.42 mm) with the lumen of their intestine being smaller than 1 mm. Hence, their digestive tract was in a nonfunctional condition which precludes the possibility of parasitic feeding. Since the length of an ammocoete previous to metamorphosis is longer than that of a transformed individual, then the larvae of these very large lampreys would be awesome giants. It is rather unfortunate that these large females were not kept alive for selective purposes.

Readers are invited to send transformed and larval lampreys for identification to the author of the present article at the following address: Department of Biology, University of Ottawa, 30 Somerset Street East, Ottawa, Ontario, K1N 6N5.

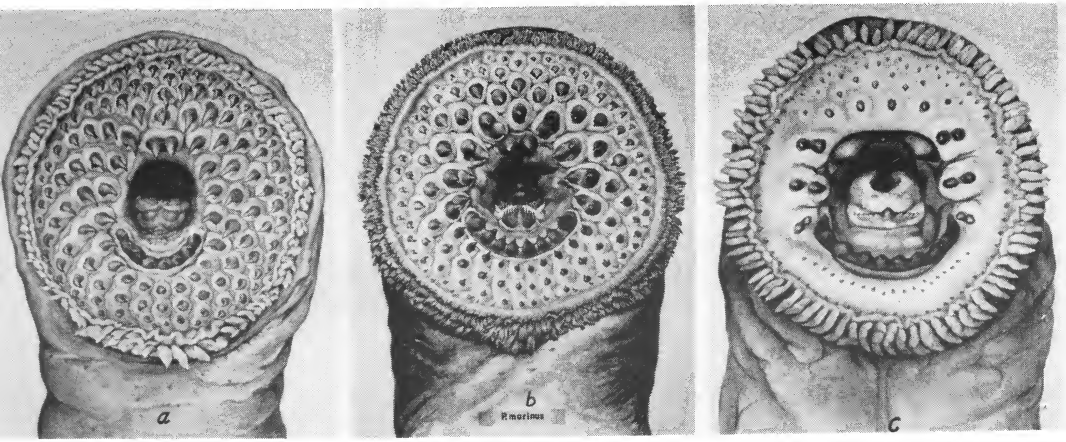

FIG.4 Sucking disc of three species of lampreys; original drawings by P. Voevodine, Quebec.

a) Silver lamprey, I. unicuspis, 4 enlarged lateral teeth each with a SINGLE cusp, on each side of the mouth;
b) Sea lamprey, P. marinus, 4 enlarged lateral teeth each with a DOUBLE cusp, on each side of the mouth;
c) American brook lamprey, L. lamottei, 3 enlarged lateral teeth with DOUBLE cusps on each side of the mouth; only 1 row of teeth on the posterial field; while the other two species have several rows on the posterial field. Supraoral lamina with strong cusp at each end separated by a bridge; in the other two species, instead of a lamina with a bridge, there is a single tooth with 2 cusps (for further details, see Vladykov & Follett, 1966).

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A WOODLAND TRAGEDY

by J. M. Robinson

Many articles have been written about the finding of extinct animals which had been caught in tar beds or quaking bogs of long ago, but few describe cases where wild animals have been seen alive in such places.

In 1929 Modeste Belair, Archie Spence and I were cruising timber north of Lac Dumont in the Pickanock portion of the Gatineau Valley. One of our lines crossed a lake with boggy edges. Here to our surprise we found a bull moose caught in a small boghole.

We cut poles and tried to pry him out. Two of us would take his antlers while the third would try to raise the moose's hindquarters. The moose realized that we were trying to help him and would remain quiescent until we began to pry. Then he would struggle forward. But the sides of the hole were too soft. Despite our placing logs alongside the hole, we could not raise him, although we tried for over an hour.

We completed our day's work and checked his condition from our return cruise line. We had no heavy ropes in camp, so there was no way we could get him out. Wolves had been howling nearby during the afternoon, so after supper we went back and killed him, rather than have him tortured when he couldn't fight back.

The accompanying picture was taken in the afternoon while the moose was still alive. This is proven by the lunch sack on Archie Spence's back, which, of course, was not carried on the evening trip.

A moose trapped in a bog north of Lac Dumont in the Gatineau Valley, P.Q.

O F N C FALL PROGRAM

Arranged by the Excursions and Lectures Committee
Ewen C. D. Todd (225-4316), Chairman

Members arriving by bus at meeting place for excursions can usually find rides with other members going by car. For further information phone leader or chairman.

BIRD IDENTIFICATION FOR BEGINNERS - a series of walks along the Ottawa River designed primarily for newcomers to bird-watching.

Saturday	Sept. 9	Leader:	George Holland	(822-6623)
"	" 16	"	Roger Taylor	(731-9270)
"	" 23	"	Stephen O'Donnell	(836-4172)
"	" 30	"	Loney Dickson	(729-1554)
"	Oct. 7	"	Arnet Sheppard	(722-0991)

Meet: Britannia Drive-in Theatre
Time: 8.00 a.m.
Bring waterproof footwear. Walks last until approx. noon.

BIRDS IN FALL MIGRATION - visits to Ottawa Beach and Shirley's Bay.

Sunday	Sept. 10	Leader:	Roger Foxall	(745-7791)
"	" 24	"	Hue MacKenzie	(722-8847)
"	Oct. 1	"	Don Lafontaine	(722-1692)
"	" 8	"	Brian Morin	(234-6170)
"	" 15	"	Monty Brigham	(728-0855)
"	" 22	"	Richard Poulin	(729-1519)

Meet: Britannia Drive-in Theatre
Time: 7.30 a.m.
Bring waterproof footwear. Walks last till noon at least.

FALL BIRDING TRIP TO PRESQUI'ILE PARK

Sunday	Sept. 17	Leaders:	Arnet Sheppard	(722-0991)
			Brian Morin	(234-6170)

Meet: Gate at park entrance.
Time: 8.00 a.m.
All day trip. Those wishing to stay overnight may make arrangements with the White House, Brighton (613-475-0004). Persons intending to drive please contact leaders.

Saturday Sept. 23 Field trip: Fall mushrooms and toadstools
Leaders: David Malloch (225-6920)
Jim Ginns (827-0212)
Meet: Health & Welfare Bldg.
Tunney's Pasture at 8.40 a.m. or
Jack Pine Trail at 9.00 a.m.
Bring basket, hand lens, and a snack.

Wednesday Sept. 27 Discussion: Mosses and liverworts - an introduction to their life history and identification
Leaders: Fabius Leblanc
Bob Ireland
Meet: St. Andrew's Presbyterian Church, Kent & Wellington, Kent St. door.
Time: 8.00 p.m.

Saturday Sept. 30 Field trip: Mosses and liverworts
Leader: Bob Ireland
Meet: Health & Welfare Bldg.
Time: 9.00 a.m.
Bring hand lens and lunch.

Saturday Oct. 14 Field trip: The crystal-gazers' outing
Leader: Bob Gault (829-7459)
Meet: Victoria Museum, McLeod St.
Time: 9.30 a.m.
An excursion for dolomite, calcite, and smoky and clear quartz crystals. Bring hammer and chisel, newspaper for wrapping, and lunch.

Wednesday Oct. 25 General Meeting: Natural areas and land conservation
Organizer: Don Oliver
Meet: St. Andrew's Church, Kent & Wellington
Time: 8.00 p.m.
Members of the Natural Areas Committee will give a brief illustrated presentation on some of the local areas of special natural interest and then discuss their concerns for the conservation of these areas. What kind of role has the Club to play in conservation of special areas? Come along and let us hear your views.

TRAIL & LANDSCAPE

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